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MANAGEMENT OF NATIONAL MAPPING AND CHARTING PROGRAMMES

Paper submitted by New Zealand

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A paper submitted by the secretariat under this agenda item at the Eleventh Conference* drew attention to the fundamental reason why the United Nations accepts the furtherance of Cartography as an integral part of its operations. Mapping provides a means to achieving better living standards, full employment, and improved conditions of economic and social progress and development, both internally and internationally, thereby positively contributing to the United Nations' ultimate objectives.

In New Zealand, a struggling economy has forced the application of severe budgetary restraints on Government expenditure and has required a substantial increase in the level of costs recovered. This has had a considerable impact on the operations of Government mapping agencies but, in spite of numerous difficulties, innovative management has enabled essential mapping programmes to be maintained. This paper explains how user needs and Government requirements are being achieved in the Department of Survey and Land Information (DOSLI), New Zealand's principal survey and mapping agency.

Operating Environment

New Zealand has moved rapidly to a "user-pays" philosophy in the provision of many products and services produced by Government departments. Several Government activities and national assets have either been converted to State Owned Enterprises and placed on a commercial footing, sold to the private sector, or discontinued altogether. Goods and services tax was introduced in 1986 and applies to all of DOSLI's prices within New Zealand. Initially set at 10% this tax was increased to 12.5% in 1989 and has had a significant impact on sales. Government has made clear its intention to reduce the size of the public sector, and to reduce and eliminate costs wherever possible. Many of DOSLI's traditional clients are other Government departments that now operate on very limited budgets and most are unable to purchase DOSLI outputs at previous levels.

Over the last four years DOSLI has moved from cost recovery levels of 7% of total costs, up to 62%. That is an increase in revenue from NZ\$3 million to NZ\$33.5 million. In 1990/91 the target is NZ\$38.5 million (70%).

In the last three years the new State Sector Act has placed chief executives and a range of senior staff on contract, and delegated financial and industrial relations responsibility. It has also made chief executives accountable through annual performance agreements and external reviews. Also, in the last two years a new Finance Act has changed the period of the financial year and required all Government departments to move from cash to accrual accounting, to pay depreciation and return on assets, and to establish monthly, weekly and daily cash flow profiles. As well,

* E/CONF.78/4/Add.1.

chief executives have to specifically identify resources and performance measures against clearly defined outputs.

These requirements have forced DOSLI to review the range of products and services provided and to make substantial changes to management structures, pricing policies and market orientation with a view both to short term survival and to positioning for the future. The long assumed benefits to the nation provided by mapping cannot be taken for granted. Activities need the continued support of Government and communities, but no longer will a standard product or service suit DOSLI's various clients. There is a need to relax any preoccupation with production as such, and take up a market orientation. It is essential to become familiar with the needs and problems facing those providing financial support as the emphasis is now being placed on the results obtained from Government expenditure, their quality, quantity and costs. Government wants outputs which materially contribute to its policies and programmes.

Outputs

Government departments are now required to classify their activities within "output" groupings approved by Government. Map production is part of the Land Information group of outputs approved for DOSLI.

By identifying individual outputs, and the resources allocated to their production, Government can decide whether it wishes to purchase a particular output, and if so in what quantity. Costs are directly identified with each output so that the costs/benefits of each activity are transparent and can be assessed in terms of priority and contribution to Government's social and economic and environmental objectives.

Organisational Changes

To enable the department to meet the challenge of achieving Government's cost recovery targets, while maintaining production at satisfactory levels, a number of organisational changes have been implemented.

- The department has been restructured to relate to a concept of a unified business of land information. Major subdivisions group surveyors, photogrammetrists and remote sensing in "Information Generation". Computer services, digital cadastral database and digital topographic databases form an "Information Management" group. "Information Applications" includes cartography, aeronautical charting, client services, land information and statutory activities. Corporate services form another group, including human resources, industrial relations, training and marketing. Divisions such as training, computer services, research and development and corporate servicing are used as a department-wide resource and work functionally with the various groups as tasks and circumstances require.

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- The organisational structure has also been "flattened", reducing the number of management levels from 5 to 3 in most areas, improving efficiencies in communication and control.
- Corporate planning has been upgraded to provided essential direction of DOSLI towards its identified priorities and objectives. This provides a systematic planning approach for the whole survey and mapping organisation. Strategic thinking, missions and goals cascade down through mid-term planning to budget-aligned business plans. The linking of resource use and programming is critical to the effective application of corporate planning. Goals, objectives, policies, and output measures of quality, quantity and unit costs all need to fit congruently into this corporate management approach.
- As well as methodically ensuring that the focus is on the right activities these need to be done exceptionally well. In this regard the concepts of Total Quality Management (TQM) can be applied. Arising out of the thinking of Dr Edward Deming and the impressive Japanese achievements, this management philosophy offers a very effective method of business improvement. While TQM in Japan has been successful largely in production-based organisations, its systematic approach to continuous business improvement through total staff participation promises major benefits in survey and mapping organisations also. Most DOSLI staff have been exposed to training on the concepts and practice of TQM, and beneficial results are already being achieved.

Map Production and Revision

For descriptive purposes it is convenient to separate mapping production and revision into four categories:

- Basic topographic mapping
- Derived mapping
- Client mapping and charting
- Cadastral mapping

- (a) Basic topographical mapping - DOSLI is the only organisation that produces large scale topographical mapping coverage of New Zealand. The chief executive of DOSLI is responsible for civil mapping under the title of Surveyor-General and for military mapping in his role as Director of Survey of the Army General staff for which he carries the honorary rank of Colonel in the New Zealand Defence Force. As the 1:50,000 large scale topographical map series is designed to suit both civil and military requirements there is no duplicated effort or wasted resources.

Although the topographical mapping function in New Zealand is centralised in DOSLI, actual map production is decentralised throughout the department's district offices. Control of production is exercised by the Head Office in Wellington through the preparation of production and revision

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programmes, the setting of specifications and standards, and the supply of materials and other logistical support.

A reduction in staff numbers working on mapping has resulted from:

- improved production methods,
- the need to divert staff to other high priority activities within DOSLI,
- the loss of approximately 15% of staff through attrition over the past four years.

This has meant that in some cases the cartographic units in district offices are now very small and the costs of servicing them from Head Office, and of providing adequate training in cartographic production, are disproportionately high in relation to their output. In the drive for increased efficiency avoidable costs have to be eliminated, and the trend is therefore towards increasing the proportion of cartographic production within Head Office, while continuing to reply upon district offices for the collection of field data as required.

The revision of topographical mapping is essential to maintain its usefulness. In addition to its direct use by purchasers, basic mapping also provides the information from which smaller scale maps are derived. With the approaching completion of the 1:50,000 topographical map coverage of New Zealand, future emphasis will be on ensuring that the series is sufficiently up-to-date to meet the demands of users and the requirements for derived mapping.

Basic topographical mapping requires ongoing Government funding support. In New Zealand, this is achieved through a direct budget allocation and through a maintenance contribution from military users. The 1:50,000 metric topographical series of 324 sheets, and its predecessor the 1:63,360 series cost approximately NZ\$4.2m per annum to produce and maintain. This cost is funded as follows:

- i) Government - 40%
 - National Security
 - military (general purpose)
 - police
 - civil defence
 - search and rescue
 - agricultural disease control
 - pollution monitoring

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Planning

- statutory purposes
- land administration/
management
- scientific studies
- land use/inventories
- resource studies
- environmental studies

Social

- education
- recreation

ii) Defence (Army) - 11%
Contribution to maintenance of military mapping.

iii) Map Sales - 36%

iv) Copyright Licensing - 13%

Production to date has almost entirely been by conventional manual methods with minimal digital input. However, research is continuing into data capture/structure/management/output systems with a view to creating a structured topographical database and the best option at present is the scanning of existing 1:50,000 scale topographical map separations.

Investigations are also being made into the feasibility of producing 1:10,000 - 1:20,000 digital topographical mapping for areas where specific needs are identified.

- (b) Derived mapping is intended to become self-funding through the sale of either published maps or derivatives. National and Forest Park maps and recreation mapping are partially funded through an agreement with the Department of Conservation whereby that department purchases sufficient maps to ensure that DOSLI recovers full production costs.

A 1:250,000 structured topographical database of New Zealand has already been created, including all information shown on the published 1:250,000 topographical map series of 18 sheets. This database will be used to produce a number of maps and charts at medium and small scales. In addition, significant sales of this data have been made to both public and private sector clients.

- (c) Client mapping and charting - All aeronautical chart production for both civil and military purposes in New Zealand is centralised in DOSLI and is carried out in Head Office by a small team of cartographers who have a close working relationship with civil and military aviation clients. As the chart specifications for each client vary in many respects a certain amount of duplication occurs in production, with a separate version of some charts being published for each client. However, with the increasing need to reduce costs, charting specifications are currently being examined with a view to producing single charts for both civil and military users where this is feasible.

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The advantages of centralised mapping are nowhere more apparent than in the production of aeronautical charts. As mentioned previously, DOSLI produces nationwide topographical data and, as New Zealand's aeronautical charting agency, is ideally placed to merge the data from the topographical and aeronautical databases. As the originator of the information, DOSLI can ensure that appropriate and consistent standards are achieved for all products.

Aeronautical charting, and all other work carried out for specific clients, is charged at full cost. This includes all products and services provided for other Government departments, local authorities, private organisations etc.

- (d) Cadastral mapping - Large scale cadastral plans are available for inspection in the department's offices in each land district. However, published mapping has been discontinued due to the high costs of production and low usage. The Infomap 261 cadastral map series at 1:50,000 scale, which was previously published, is now maintained in the form of transparencies by local offices and plan print copies are able to be purchased.

A digital cadastral database (DCDB) is being established, updated on a daily basis as changes are made on approved survey plans. Full national coverage is expected to be available in 1992, and data is already being licensed to users to recover costs.

Integration

With the development of computer technology, the historical lines between specialised activities such as surveying, photogrammetry, cartography, and so on, have become blurred. The disciplines that contribute to mapping can no longer operate efficiently if they focus on their own perceived needs in ignorance of the wider requirements of information systems.

DOSLI's responsibility for geodetic, survey, cadastral and topographical systems has facilitated the change from manual to digital methods. The aggregation of data and the incremental increases in knowledge through making a variety of relationships, connections, etc. yield new levels of information beyond that evident from the sum of individual data components. Clearly, independent and restricted data bases and systems are no longer adequate even for their primary original purpose.

The emphasis on only a single end product or service is no longer an efficient or economic manner in which to utilise the basic data resource. The problem is that insufficient attention has in the past been paid to data as the basis of a service or product. New digital technologies show up the foolishness of separate and duplicated land information activities. In addition, these emerging technologies provide the means for an immensely improved cost effectiveness and increased information support. The competition for public money and the taxpayers demand for value

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make the attention to the low cost provision of land information imperative.

The technique and technology challenges now being overcome are being replaced by management and economic challenges. A systematic and corporate approach is needed which links data bases and activities, and provides the greatest cost effectiveness. An organisation-wide information strategy is important so that various components can be interrelated and can form modules for further growth and development.

The various technological and management issues have been addressed by DOSLI, and have resulted in corporate policies that recognise the integration of land information as the key to future growth and progress. Databases are designed as part of a land information business, rather than with specific uses or products in mind.

Copyright and Licensing

All information generated by DOSLI is protected by the New Zealand Copyright Act for a period of fifty years.

A range of standard licences has been created for the use of land information by other organisations. This is necessary both to provide a source of revenue, and to protect the department's data from misuse, while allowing legitimate uses of information at appropriate cost.

Pricing Policies

Prices and charges for most products and services have risen from free-of-charge or token payment to either full cost recovery rates or to a level that maximises revenue. For example, the price of a 1:50,000 scale topographical map has risen from NZ\$2.00 in 1987 to NZ\$11.65 in 1990, and while sales volumes have fallen net revenue has considerably increased.

Geographical Names

A vital function of any mapping organisation is to ensure that maps depict correct geographical names. The New Zealand Geographic Board was established by an Act of Parliament in 1946 to provide a central authority for the approval of place names in New Zealand. The Surveyor-General is permanent chairperson of the Board, and secretarial support is provided by the department.

An emphasis is placed on identifying original indigenous names and adopting these where appropriate. Considerable research is required, as many Maori names exist only in oral history or in widely dispersed written records, and DOSLI is to become more active in establishing a network of information sources throughout New Zealand.

New Zealand also has a close association with other Pacific countries through the early migrations, and many names occur in a

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number of countries, sometimes in groups. In November 1990 DOSLI hosted a Pacific Place Names Conference which was attended by delegates from several pacific countries. Three further international geographical names conferences are scheduled to be held in New Zealand in 1992.

Off-shore Projects

Through its experiences during recent years, DOSLI has become a leaner, more efficient organisation, and has developed strategies that should ensure continuing growth and progress in the land information business. It is appropriate that the benefits of DOSLI's experience should be shared with other countries, and the department has become more proactive in seeking off-shore opportunities in Asia and the South Pacific. The Pacific rim is seen as a significant growth area for the future, and DOSLI is well positioned to participate in international cooperation and resource management. Many countries are now developing their own land information systems and need effective environmental monitoring and land management and land tenure systems. New Zealand's position as a developed Pacific country with strong indigenous links provides countries seeking land information management skills and assistance with an ideal partner. In particular, New Zealand offers cost effective solutions to countries that have resource constraints.

Currently, DOSLI is involved with the provision of a land information strategy for Fiji, two staff have been posted to Niue to assist with the introduction of a land titling system, and assistance is also being provided to the Western Samoan Government for their survey and mapping operations. Representations will be made to the Asian Development Bank and the World Bank with a view to promoting New Zealand's capabilities in providing this type of assistance to other countries.

Conclusion

Although Government mapping agencies in New Zealand have been subjected to a rapidly changing operating environment due to a deterioration in the national economy, the Department of Survey and Land Information has been able to successfully adapt to the new conditions.

By accepting that change is necessary, rather than resisting the inevitable, the department has been able to make adjustments in a controlled way, meeting the Government's budgetary requirements while still maintaining essential mapping programmes.

A review of activities, organisational restructuring, increases in prices and charges, the development of a market orientation, the introduction of a Total Quality Management philosophy and the pursuit of off-shore ventures are some of the management initiatives that have been implemented.

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However, the important issue for future progress is the development of a fully integrated land information database from which a wide range of products and services can be extracted to enable clients and Government to achieve their commercial, social and economic objectives.
